DOCUMENT RESUME

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IDENTIFIERS *Dimensioning (Mechanical Drawing); Preapprenticeship Programs; *Scaling (Mechanical Drawing)

ABSTRACT

This self-paced student training module on scaling and dimensioning is one of a number of modules developed for Pre-apprenticeship Phase 1 Training. Purpose of the module is to teach students the concepts of scales and dimensions, their symbols, and how they are applied in reading and drawing blueprints. The module may contain some or all of the following: a cover sheet listing module title, goal, and performance indicator; study guide/checklist with directions for module completion; introduction; information sheets providing information and graphics covering the module topic(s); self-assessment; self-assessment answers; post assessment; and post-assessment answers. (YLB)

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ED217275

INDIVIDUALIZED LEARNING SYSTEMS

PRE-APPRENTICESHIP PHASE 1 TRAINING

SCALING AND DIMENSIONING

CE 032 911

CE 00183

Goal:

The student will learn the concepts of scales and dimensions, their symbols and how they are applied in reading and drawing blueprints.

Performance Indicators:

The student will demonstrate the acquired knowledge by successfully completing a Self Assessment exam and a Post Assessment Exam.

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Study Guide

For successful completion of this module, complete the tasks in the order listed below. Check each one off as you complete it.

1. ____ Read the Goal and Performance Indicators on the cover of this module. This will explain what you can be expected to learn from the module and how you will demonstrate it.

2. ____ Read the Introduction section and study the Information section. In these sections you will acquire the knowledge necessary to pass the Self and Post Assessment exams.

3. ____ Complete the Self Assessment exam. This will show you how well you can expect to do on the Post Assessment exam. Compare your answers with those on the Self Assessment Answer Sheet found immediately following the exam. If you scored poorly, re-study the Information section or ask your instructor for help.

4. ____ Complete the Post Assessment exam. Turn the answers in to your instructor. It is recommended you score 90% or better before continuing with the next module.

Introduction

Full-size (full-scale) working drawings are often used for the graphic representation of small technical objects or their parts. Most working drawings for large projects, however, are made to a reduced size or scale, each line being drawn a fraction of the actual length it represents.

In general, all the dimensions needed to fabricate, assemble, or inspect the object will be given on a well-executed working drawing, and they will be presented in a way that is convenient for the worker. If he or she has a thorough understanding of the conventions used by the draftsperson, the user should seldom find it necessary to determine any dimensions by calculation or by scaling (using an architect's scale or a rule to take a measurement directly off the drawing). Calculation is the preferred method for determining an unknown dimension on a working drawing; because of errors that might arise from such factors as shrinkage or expansion of the paper, scaling is not recommended.

Information

SCALE

The scale of a drawing is the ratio of drawing dimensions to object dimensions. The choice of scale for a working drawing depends on convenience, the space available on the sheet, and the amount of detail that must be shown. The scale used is always indicated on the drawing. A machine part may be drawn half size; in this case, the drawing would be made to half scale, which would be indicated as 1/2" = 1'. Floor plans and exterior elevations for buildings are often drawn 1/48th size, or to a scale of 1" = 10'0". A single scale is employed for every part of a given drawing; however, different scales may be used for other drawings in the set.

The measuring devices used in the making of scale drawings are known as "scales." Commonly used instruments of this type include the architect's scale, the engineer's scale, and the mechanical draftsperson's scale. The architect's scale is the type used to lay out drawings of buildings and their components. (See Fig. F-3.) A triangular architect's scale of the type illustrated has on its three faces a total of ten reduced-size scales ranging from 3/32" = 1'0" to 3" = 1'0". One face also has a full-size scale in inches, like that of a standard ruler.

The technique of measurement with an architect's scale is illustrated in Fig. F-4. The unknown dimensions A-B is to be determined on a drawing having a scale of 1/4" = 1'0". The architect's scale is placed on the drawing as shown, with the scale mark corresponding to the largest number of whole feet in the dimensions (10 ft. in this instance) directly under extension line A. Extension line B will then fall on the short graduated scale that extends to the right of zero. Each of the small graduations to the right of zero represents one inch on the 1/4" = 1'0" scale; the dimensions A-B in the given problem is therefore 10 ft. 9 in. If an unknown dimension is 12 in. or less, it can of course be read directly from the short inch scale.

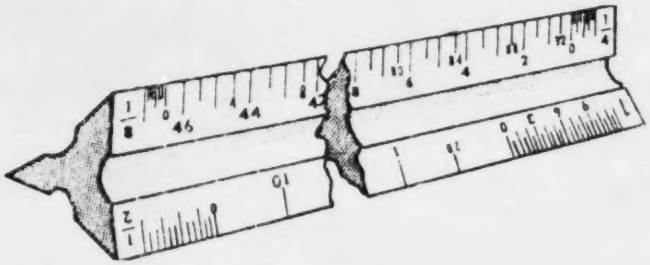


Fig. F-3. An architect's scale

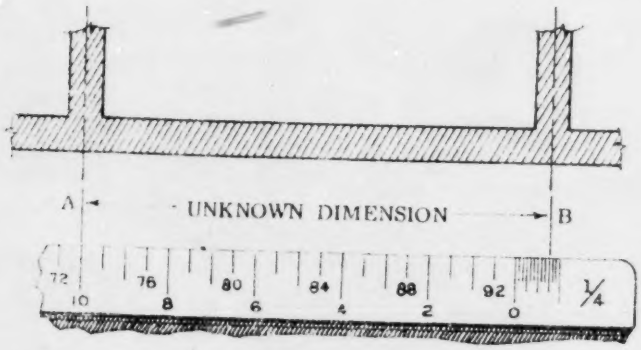


Fig. F-4. Using an architect's scale (1/4" = 1'0" scale)

DIMENSIONS

The drawing or shape-description of an object is incomplete without dimensions or size-description. Dimensions are located on working drawings by means of dimension lines and extension lines, which are light-bodied solid lines so placed on the drawing that they cannot be misinterpreted as being part of the object. Extension lines mark the beginning and the end of the distance for which a dimensions is shown; they extend at a right angle from the desired locations on the drawing, with a gap of about 1/16 in. between the extension line and the drawing. Dimension lines indicate the distance between two points, usually between two extension lines; they are placed outside the drawing of the object whenever possible. Dots or arrows (the latter uniform in size and shape, about 1/8 in. long and narrow) are placed at the ends of the line, and the numbers giving the dimensions are placed near the line, usually at the midpoint. (See Fig. F-5.)

An arc is dimensioned by giving its radius, as shown in Fig. F-6. A circle may be dimensioned by giving either its radius or its diameter; unless the reference is obvious, the dimension number should be followed by R or D, indicating radius or diameter. If the circle represents a hole that is to be drilled, bored, reamed,

.. or punched, its diameter is specified by a short note, which is connected to the circle by a line called a leader.

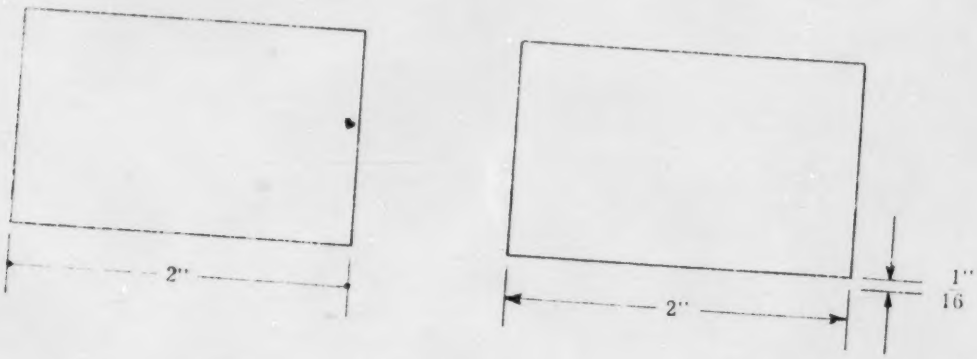


Fig. F-5. Dimensions and extension lines

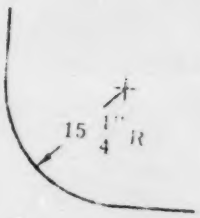


Fig. F-6. Dimensioning an arc

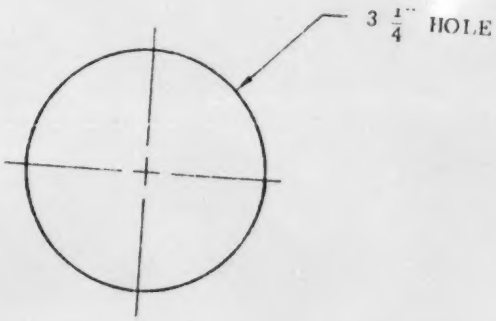
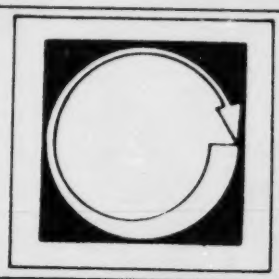


Fig. F-7. Dimensioning a hole

The placement of dimensions should be governed by two considerations: an orderly arrangement and convenience for the workers who are to consult the drawing. At times, space limitations or the necessity for keeping the drawing uncluttered make it necessary to omit one or more dimensions; in this case, the draftsperson will include all the dimensions most needed for understanding the drawing, relying on the worker to calculate omitted dimensions from those given.

Self Assessment



Read each statement and decide whether it is true or false. Write T if the statement is true; write F if the statement is false.

1. ____ The scale of a working drawing is the ratio of the drawing size to the object size.

2. ____ All the drawings in a set are made to the same scale.

3. ____ Dimension lines and extension lines are drawn lighter than the lines of the object.

4. ____ Dots or arrows are used to mark the ends of dimension lines.

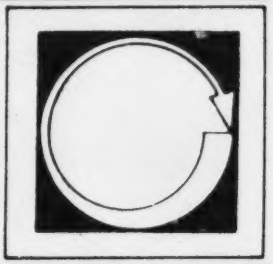
5. ____ An architect's scale is a four-sided instrument.

6. ____ An arc may be dimensioned by giving its radius or its diameter.

SELF ASSESSMENT ANSWER SHEET

1. T
2. T
3. T
4. T
5. F
6. F

Post Assessment



Listed below each numbered item are four possible answers or completing phrases. Decide which of the four is correct, or most nearly correct; then write the corresponding letter in the blank space to the left of that item.

1. ____ The scale of a drawing is the ratio of:

   a. width to height
   b. height to width
   c. drawing dimensions to object dimensions
   d. object dimensions to drawing dimensions

2. ____ If an object is drawn 1/48th size, the scale of the drawing is:

   a. 1/48" = 1'0"
   b. 1/4" = 1'0"
   c. 4" = 48"
   d. 48" = 4'0"

3. ____ On a site development plan drawn to a scale of 1" = 10'0", a 40' x 80' building would be drawn:

   a. 2" x 4"
   b. 4" x 8"
   c. 12" x 24"
   d. 40" x 80"

4. ____ The scale of a working drawing can be determined by:

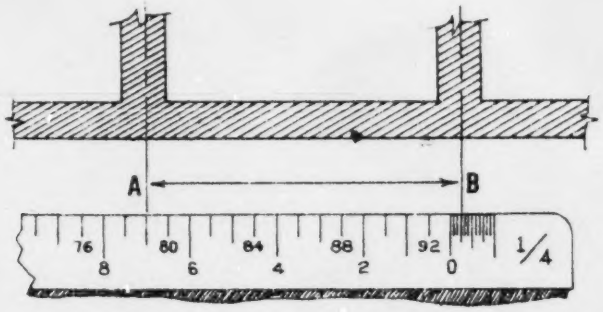
   a. inspecting the drawing on which the scale used will be specified
   b. consulting the contractor
   c. looking under "scale" in the specifications
   d. dividing any given dimension by 48

5. ____ When some dimensions must be omitted in the making of a working drawing, the ones given should be:

   a. those that will best fit in the available space
   b. those most needed for understanding the drawing
   c. the smaller dimensions
   d. the larger dimensions

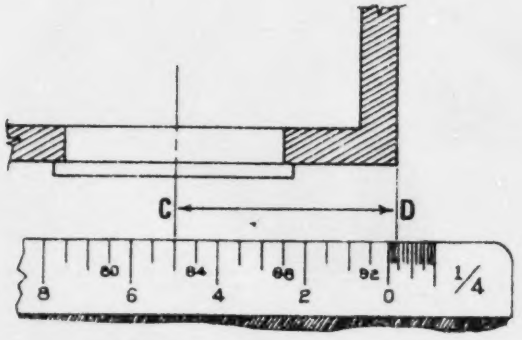
6. ____ The dimension A-B in the drawing below, as indicated on the architect's scale is:

a. 6'0-1/4"
b. 6'4"
c. 7'3"
d. 8'3"



7. ____ The dimension C-D in the drawing below, as indicated on the architect's scale is:

a. 4'8"
b. 5'2"
c. 5'8"
d. 6'8"



8. ____ A hole is to be drilled in a part. How can the dimensions of the hole be indicated most conveniently on a drawing of the part?

a. by providing complete written instructions for locating and making the hole
b. by dimensioning the material on both sides of the hole
c. by a brief note connected by a leader to the hole
d. by drawing an extension line from each side of the hole

9. ____ The line shown below is a(n):

a. extension line
b. dimension line
c. break line
d. scale line